Plant photosynthesis inhibited by bacterial ancestor

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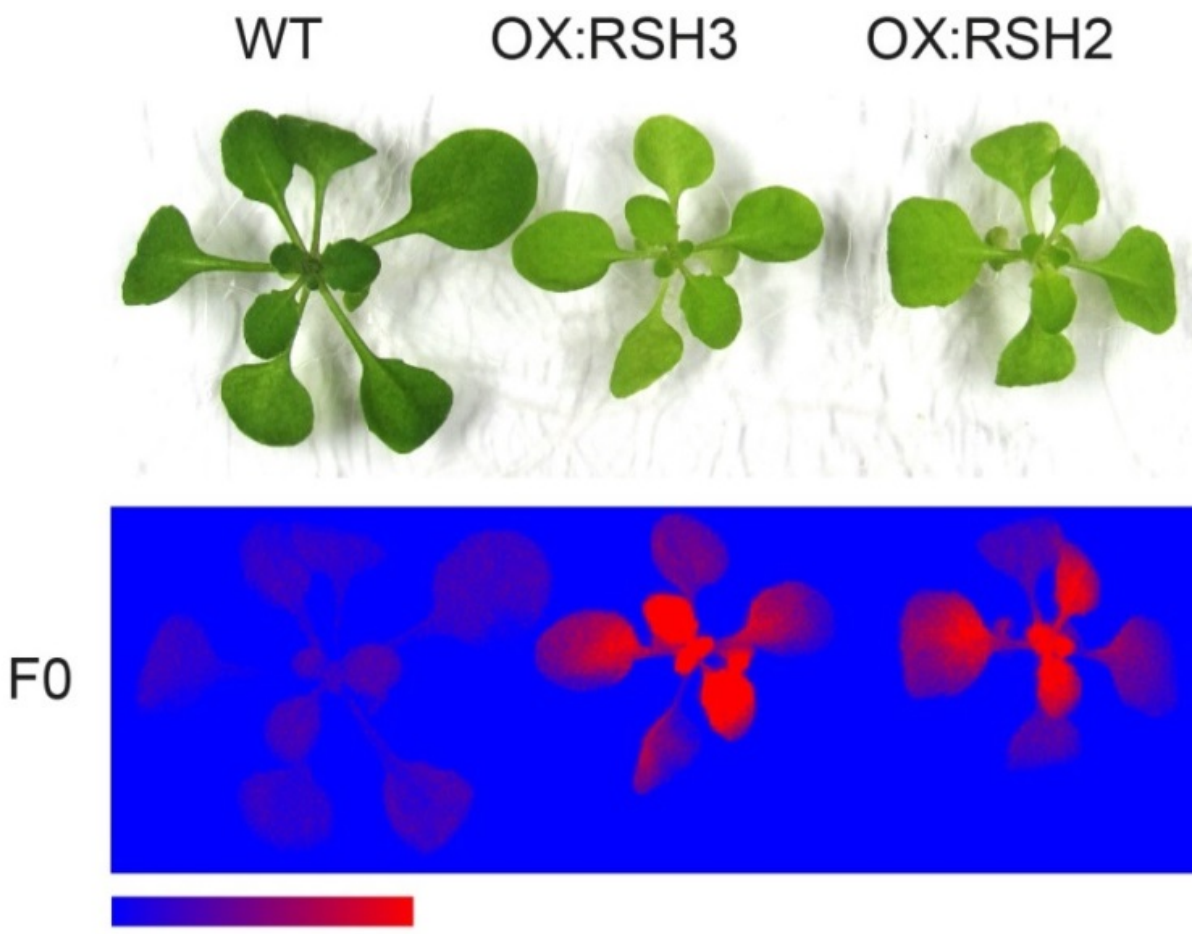

Researchers at CNRS, CEA and Université d'Aix-Marseille have demonstrated that an ancient signaling pathway inherited from bacteria impacts plant growth and development. Chloroplast, the compartment responsible for plant photosynthesis, is a key component of this signaling pathway. Understanding how this signaling pathway functions would allow for development of strategies to protect crops against climatic change and to improve photosynthesis so as to generate biofuels and other valuable products. These findings were published in Plant Cell on 25th February 2016.

Researchers at CEA, CNRS and Université d'Aix-Marseille have investigated a signaling pathway, scarcely studied until now, which was already present in the bacterial ancestor of chloroplast, the compartment where photosynthesis takes place. This signaling pathway is dependent on a molecule that plays an important role in bacterial stress response: Guanosine tetraphosphate. By genetically modifying the guanosine tetraphosphate content in plant chloroplast, the researchers have shown that it inhibits chloroplast activity, impacting both function and size. Surprisingly, the researchers have also shown that this bacterial signaling pathway plays a key role in communication between the chloroplast and the cell nucleus that regulates plant growth and development.

This signaling pathway could be used to optimize the photosynthetic efficiency of plants subject to water and nutrient deficiencies, with potential applications in agriculture and reactor-based crop development for green chemistry and algae-based biofuel solutions.

Photosynthesis takes place in chloroplast, which arose from an endosymbiotic relationship between a unicellular eukaryote organism[(common ancestor of plants and animals) and a bacterium over a billion years ago. This relationship enables photosynthetic eukaryotes (green plants and algae) to support ecosystems throughout the planet.

More information: Matteo Sugliani et al. An ancient bacterial signaling pathway controls chloroplast function to regulate growth and development in Arabidopsis., *The Plant Cell* (2016). DOI: 10.1105/tpc.16.00045

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